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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/888,642	06/26/2001	Toshio Haba	500.40269X00	9091

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EXAMINER	
WONG, EDNA	
ART UNIT	**PAPER NUMBER**
1753	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/888,642	HABA ET AL.	
	Examiner	Art Unit	
	Edna Wong	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-13 is/are pending in the application.

4a) Of the above claim(s) 1,2,4,5,7,8,10 and 11 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 3,6,9,12 and 13 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Election/Restrictions

Applicant's election of specie (c) compounds represented by the formula I (claims **3, 6, 9, 12 and 13**) in Paper No. 4 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Applicants' remarks focused on rejoining the claims rather than pointing out the supposed errors in the restriction requirement.

Accordingly, claims **1-2, 4-5, 7-8 and 10-11** are withdrawn from consideration as being directed to a non-elected invention.

Specification

The disclosure is objected to because of the following informalities:

page 4, line 7, the word "plat" should be amended to the word -- flat --.

page 14, line 22, the compound "bis (4-sulfobuthyl) disulfide" should be amended to the compound -- bis (4-sulfobutyl) disulfide --.

page 19, line 11, the word "plated" should be amended to the word -- plating --.

page 20, lines 6-7, it is unclear what is meant by "Table 2 under".

page 21, Table 2, the words "Presence of boid" should be amended to -- Presence of void --.

page 23, line 15, the word "steps" should be amended to the word -- Figs. --.

page 23, line 17, the word "plated" should be amended to the word -- plating --.

page 23, line 24, the word -- the -- should be inserted after the word "of".

page 27, line 2, it is unclear what is meant by "on the to produce".

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

I. Claim **13** is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for (a) with an addition of at least one of cyanine

dyes, (b) with the addition of at least one of indolium compounds, **or** (c) with an addition of at least one of the compounds represented by the following formula (I), does not reasonably provide enablement for (a) with an addition of at least one of cyanine dyes, (b) with the addition of at least one of indolium compounds, **and** (c) with an addition of at least one of the compounds represented by the following formula (I). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

Applicants' specification discloses using only one type of additive per bath (page 17, Table 1). For example,

Sample 1: contains A1

Sample 2: contains A3

Sample 3: contains A2

This situation is "**or**" in these samples, i.e., A1, A2 or A3 because A1, A2 and A3 are never in one bath altogether.

There is no disclosure in the specification for using a cyanine dye, an indolium compound **and** a compound represented by formula I, i.e., A1, A2 and A3, altogether in one bath as presently claimed. Thus, claim 13 is not commensurate in scope with Applicants' specification.

II. Claims **3, 6, 9, 12 and 13** are rejected under 35 U.S.C. 112, second paragraph,

as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3

lines 2-3, it is unclear what is meant by "at least one of **electrolytes with an addition** of at least one of the compounds represented by the following general formula". Are the electrolytes addition compounds?

Claim 13

lines 2-5, it is unclear what is meant by "at least one of **electrolytes** (a) **with an addition** of at least one of cyanine dyes, (b) **with an addition** of at least one of indolium compounds, and (c) **with an addition** of at least one of the compounds represented by the following general formula (I)". Are the electrolytes addition compounds?

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Bath

I. Claim **3** is rejected under 35 U.S.C. 102(b) as being anticipated by **Gerenrot et**

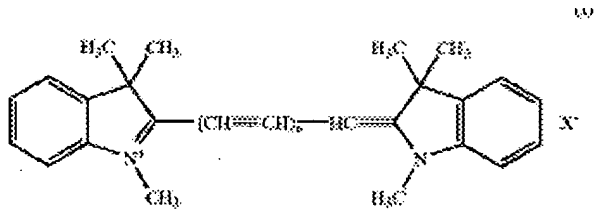
al. ("Effect of the Structure of Carbocyanine Dyes on the Leveling Power During the Electrodeposition of Copper", *Zashchita Metallov* (1972), Vol. 8, No. 3, pp. 338-342).

Gerenrot teaches a copper electroplating bath comprising:

a solution (= acid solutions) containing:

(a) copper ions (= $CuSO_4$); and

(b) at least one of electrolytes (= H_2SO_4) with an addition of at least one of the compounds represented by the following general formula:



where X^- is an anion (= ClO_4^-), and n is 1 (abstract; and page 339, Table, leveling additive No. 5).

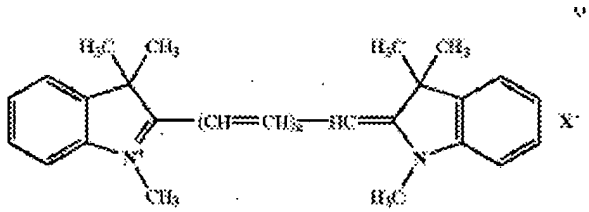
II. Claim **13** is rejected under 35 U.S.C. 102(b) as being anticipated by **Gerenrot et al.** ("Effect of the Structure of Carbocyanine Dyes on the Leveling Power During the Electrodeposition of Copper", *Zashchita Metallov* (1972), Vol. 8, No. 3, pp. 338-342).

Gerenrot teaches a copper electroplating bath comprising:

a solution (= acid solutions) containing:

(a) copper ions (= $CuSO_4$); and

(b) at least one of electrolytes (= H_2SO_4) with an addition of at least one of the compounds represented by the following general formula (I):



where X^- is an anion (= ClO_4^-), and n is 1 (abstract; and page 339, Table, leveling additive No. 5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Bath

I. Claims **6 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Gerenrot et al.** ("Effect of the Structure of Carbocyanine Dyes on the Leveling Power During the Electrodeposition of Copper", *Zashchita Metallov* (1972), Vol. 8, No. 3, pp. 338-342) as applied to claim 3 above, and further in view of **Barstad et al.** (US Patent No. 6,444,110 B2).

Gerenrot is as applied above and incorporated herein.

Gerenrot does not teach wherein one or more of polyethers, organic sulfur

compounds and halide ions is further added to said copper electroplating bath.

However, Barstad teaches that high brightener concentrations can accelerate the plating rate in recesses and microvias as carrier molecules become incorporated into plating deposit (col. 2, lines 55-62) and that the use of a suppressor agent in combination with elevated brightener concentrations can result in effective "bottom-fill" copper plating of microvias or other aperture without defects such as inclusions or voids (col. 3, lines 20-30). The brightener has the formula R'-S-R-SO_3X (col. 5, lines 3-67) and the suppressor agent has the formula R-O-$(CXYCX'Y'O)_nH$ (col. 6, lines 23-38).

The plating bath contains a halide ion source (col. 4, lines 20-33; and col. 8, Examples 1 and 2).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the copper electroplating bath of Gerenrot with wherein one or more of polyethers, organic sulfur compounds and halide ions is further added to said copper electroplating bath because adding one or more polyethers would have resulted in effective "bottom-fill" copper plating of microvias or other aperture without defects such as inclusions or voids, and adding organic sulfur compounds would have accelerated the plating rate in recesses and microvias as carrier molecules become incorporated into plating deposit as taught by Barstad (col. 3, lines 20-30; col.

5, lines 3-67; col. 4, lines 20-33; and col. 8, Examples 1 and 2).

As to wherein at least one or more of the compounds of the general formula (I) is added at a concentration of 1 to 15 mg/L, the concentration of the compounds of the general formula (I) is a result-effective variable and one skilled in the art has the skill to calculate the concentration that would determine the success of the desired reaction to occur, e.g., leveling, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Gerenrot teaches $5x10^{-6}$, $5x10^{-5}$ and $5x10^{-4}$ M of a leveling additive (abstract).

Process

II. Claim **12** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Landau** (US Patent No. 6,261,433 B1) in combination with **Gerenrot et al.** ("Effect of the Structure of Carbocyanine Dyes on the Leveling Power During the Electrodeposition of Copper", *Zashchita Metallov* (1972), Vol. 8, No. 3, pp. 338-342).

Landau teaches a process for producing a semiconductor integrated circuit device comprising the steps of:

(a) providing an insulating layer **16** having features **17, 32** on the top of the major surface of a semiconductor wafer **14** which has a plurality of circuit element areas **15** formed (Fig. 1A),

(b) depositing a barrier metal layer **20** and a seed metal layer **21** on the bottoms

and the side surfaces of said features and on the top surface of said insulating layer (Figs. 1B and 1C), and

(c) filling the inside of said features with copper **22** by electroplating with a copper electroplating bath (col. 2, line 15 to col. 3, line 45; and Figs. 1A-1E).

Landau does not teach wherein the copper electroplating bath is the bath according to claim 3.

However, Gerenrot teaches the copper electroplating bath according to claim 3 (abstract).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the copper electroplating bath of Landau with wherein the copper electroplating bath is the bath according to claim 3 because the bath according to claim 3 would have been doing the same endeavor of electroplating copper. It has been held that the selection of a known material based on its suitability for its intended use supports a prima facie obviousness determination. See MPEP § 2144.06 and § 2144.07.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Edna Wong whose telephone number is (703) 308-3818. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt. Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1495.

Edna Wong
Primary Examiner
Art Unit 1753

EW
October 15, 2003